experiments of Franck and Hertz on excitation, we see energy states in atoms. Our job is to describe both the wave patterns and the individual events that resemble the action of particles. This is nature and not, as is often said, a "contradiction." Instead of fighting straw men, we put the emphasis on describing nature. As de Broglie pointed out, the existence of wave-like and particle-like aspects of light suggest that there may be wave-like aspects of the behavior of matter. We can now show the wave nature through the same wave properties we found many times in our earlier wave discussion. The standing matter waves finally give the explanation of the energy states.

Let us look back for a moment and see how the wave concept, for example, pervades the course, and is used to deepen the student's understanding of science. In the introduction to the course, the identifying colors of characteristic spectra are used simply as evidence of the existence of elements and atoms. Next, in the study of waves, we identify spectral color with frequency. Then in mechanics and electricity, when we lay the basis of the Rutherford model, the introduction of photons changes frequency to energy. This permits us to associate spectra with the atom as a picture of its energy states; and the Bohr model results. Matter waves then finish the picture. The concepts of energy states and wave phenomena then carry us into the new realm of nuclear physics, where we are also able to examine the outstanding evidence that $E = mc^2$, and to understand the basis of nuclear fission and fusion.

In this course the logical unity of the subject is apparent. This integration of knowledge makes it possible for understanding to aid memory far more than usual. In addition, the integration of ideas gives the student the sense of a continuing development which in itself is intellectually exciting. The repeated appearance of certain concepts, such as submicroscopic particles, is essential. So also is the patient and detailed treatment of certain subjects. We explore parts of optics, mechanics, and atomic physics more deeply than usual in order to show how we develop a field of thought. The price is subordination and even omission of many subjects commonly covered in high school courses. Heat and sound are not treated as independent subjects, but more nearly as examples: sound as an example of waves, heat as related to kinetic theory and to the conservation of energy. Hydrostatics and hydrodynamics are out. Technological applications are cut far back at all points.

Such radical omissions are necessary. In fact, the committee's deliberations began with pleas from science teachers to reduce substantially the sheer bulk of the current physics course in order to fulfill its purposes within the time allotted to the subject. The material that remains in our selection still leaves a one-year course more crowded than the teacher would like. In the next phase of our work, we may learn where to cut still further.